

1183  
containing  
surfactant

SUB 181

21. Additive-stabilized, water-soluble metal oxide colloids having particle sizes ranging from 0.5 - 5 nm, comprising at least one metal of groups VIb, VIIb, VIII, Ib or IIb of the Periodic Table, and stabilized by at least one water-soluble additive.

surfactant esp. dodecylamine (propyl acetate) or PVP or polyacrylic acid

A 2

22. Colloids according to claim 21, which are monometal-oxide colloids having particle sizes ranging from 0.5 - 5 nm, comprising a metal of groups VIb, VIIb, VIII, Ib or IIb of the Periodic Table, and stabilized by at least one water-soluble additive.

pt oxide

23. Colloids according to claim 21, which are bimetal-oxide colloids or multimetal-oxide colloids having particle sizes ranging from 0.5 - 5 nm, comprising a plurality of metals of groups VIb, VIIb, VIII, Ib or IIb of the Periodic Table, and stabilized by at least one water-soluble additive.

Pt FeO or Pt SnO or Pt FeO  
or Pt WO

24. Colloids according to claim 21, which are bimetal-oxide colloids or multimetal-oxide colloids having particle sizes ranging from 0.5 - 5 nm, comprising a metal of the main group of the Periodic Table and one or more metals of groups VIb, VIIb, VIII, Ib or IIb of the Periodic Table, and stabilized by at least one water-soluble additive.

main group

IVa

25. Colloids according to claim 24, wherein said metal of the main group of the Periodic Table is tin.

26. Colloids according to claim 21, wherein said at least one water-soluble additive is selected from the group consisting of amphiphilic betains, cationic surfactants, anionic surfactants, nonionic surfactants, and water-soluble polymers.

27. A process for preparing colloids according to claim 21, said process comprising hydrolyzing or condensing at least one metal salt in an aqueous solution comprising a base in the presence of a stabilizing water-soluble additive.

28. The process according to claim 27, which is for the preparation of monometal-oxide colloids, and comprises hydrolyzing or condensing a salt of a metal of groups VIb, VIIb, VIII, Ib or IIb of the Periodic Table in an aqueous solution comprising a base in the presence of a stabilizing water-soluble additive.

29. The process according to claim 27, which is for the preparation of bimetal-oxide colloids or multi-metal oxide colloids, and comprises hydrolyzing or condensing salts of a plurality of metals of groups VIb, VIIb, VIII, Ib or IIb of the Periodic Table in an aqueous solution comprising a base in the presence of a stabilizing water-soluble additive.

30. The process according to claim 27, which is for the preparation of bimetal-oxide colloids, and comprises hydrolyzing or condensing a salt of a metal of the main group of the Periodic Table and a salt of a metal of groups VIb, VIIb, VIII, Ib or IIb of the Periodic Table in

an aqueous solution comprising a base in the presence of a stabilizing water-soluble additive.

31. The process according to claim 30, wherein said salt of said metal of the main group of the Periodic Table is  $\text{SnCl}_2$  or  $\text{SnCl}_4$ .

32. The process according to claim 27, wherein the stabilizing water-soluble additive is selected from the group consisting of amphiphilic beatins, cationic surfactants, anionic surfactants, nonionic surfactants, and water-soluble polymers.

33. The process according to claim 27, wherein the base is an alkali metal carbonate, an alkaline earth metal carbonate, an alkali metal bicarbonate, an alkaline earth-metal bicarbonate, an alkali metal hydroxide, an alkaline earth metal hydroxide, an alkali metal phosphate, an alkaline earth metal phosphate, an alkali metal hydrogen phosphate or an alkaline earth metal hydrogen phosphate.

34. The process according to claim 33, wherein the base is  $\text{Li}_2\text{CO}_3$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{K}_2\text{CO}_3$ ,  $\text{Cs}_2\text{CO}_3$  or  $\text{MgCO}_3$ .

35. The process according to claim 27, which is conducted at a temperature between 20 and 100°C.

36. The process according to claim 35, which is conducted at a temperature between 50 and 90°C.

37. The process according to claim 27, which is for the preparation of bimetal-oxide colloids or multi-metal-oxide colloids, and further comprises choosing the mass ratio of metal salts to control the mass ratio of metals in the bimetal-oxide colloids or multimetal-oxide colloids.

38. A process for preparing water-soluble, nanostructured, monometal colloids, bimetal colloids or multimetal colloids each having particle sizes ranging from 0.5 - 5 nm, said process comprising:

- a) preparing monometal-oxide colloids, bimetal-oxide colloids or multimetal-oxide colloids according to the process of claim 27; and
- b) reducing said monometal-oxide colloids, bimetal-oxide colloids or multimetal-oxide colloids.

39. The process according to claim 38, which is conducted in the presence of a reduction agent selected from the group consisting of hydrogen, hypophosphite or formate.

40. A process for fixing colloids according to claim 21 onto solid supports, said

*may be*  
process comprising treating solid oxidic or non-oxidic solid materials with an aqueous solution of the colloids. *the support*

*metals*  
41. A process for fixing colloids prepared by the process according to claim 38 onto solid supports, said process comprising treating solid oxidic or non-oxidic solid materials with an aqueous solution of the colloids.

*metal oxides*  
42. A process for immobilizing colloids according to claim 21, said process comprising incorporating said colloids into sol-gel-materials.

*metals*  
43. The process according to claim 42, wherein the sol-gel materials are prepared from gel precursors, which gel precursors are  $\text{Si}(\text{OCH}_3)_4$  or mixtures of  $\text{Si}(\text{OCH}_3)_4$  and  $\text{C}_n\text{H}_{2n+1}\text{Si}(\text{OCH}_3)_3$  ( $n=1$  to 4).

*metals*  
44. A process for immobilizing colloids prepared by the process according to claim 38, said process for immobilizing comprising incorporating said colloids into sol-gel-materials.

45. The process according to claim 44, wherein the sol-gel materials are prepared from gel precursors, which gel precursors are  $\text{Si}(\text{OCH}_3)_4$  or mixtures of  $\text{Si}(\text{OCH}_3)_4$  and  $\text{C}_n\text{H}_{2n+1}\text{Si}(\text{OCH}_3)_3$  ( $n=1$  to 4).